

SEQUENCE LISTING

<110> DeBonte, Lorin R. Fan, Zhegong Miao, Guo-Hua <120> FATTY ACID DESATURASES AND MUTANT SEQUENCES THEREOF <130> 07148-063003 <140> US 09/771,904 <141> 2001-01-29 <150> US 08/874,109 <151> 1997-06-12 <160> 70 <170> FastSEQ for Windows Version 4.0 <210> 1 <211> 1155 <212> DNA <213> Brassica napus <220> <221> CDS <222> (1)...(1152) <223> Wild type Fad2 <221> misc feature <222> 205 <223> n = a, g, c, or t/u<400> 1 atg ggt gca ggt gga aga atg caa gtg tct cct ccc tcc aag aag tct 48 Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser gaa acc gac acc atc aag cgc gta ccc tgc gag aca ccg ccc ttc act 96 Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr 20 25 gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg 144 Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser 35 40 45 ate cet ege tet tee tee tac etc ate tgg gae ate ate ata gee tee 192 Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser 50 55 60 tgc ttc tac tac ntc gcc acc act tac ttc cct ctc ctc cct cac cct 240 Cys Phe Tyr Tyr Xaa Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro

65					70					75					80	
						cct Pro				-	-			_	-	288
			_		-	ata Ile	_		_	-				_		336
_	-		_			gac Asp	-		-							384
			_			ttc Phe 135			_		_		_	-		432
						ctc Leu		_	_	_			_		_	480
_	_		_		_	tgg Trp			_						_	528
	_			_		acg Thr						_	_	_	-	576
		_			_	tcg Ser					_				_	624
						gct Ala 215										672
_					_	gct Ala				_	-	_				720
						cag Gln										768
	-	_		_		gtc Val						_				816
_	_		_			tcc Ser					_	_				864

Asp Trp Phe 290	agg gga Arg Gly								912
ttg aac aag Leu Asn Lys 305	Val Phe			-		_			960
ccg ttc tcc Pro Phe Ser		_		-		Thr		_	1008
ata aag ccg Ile Lys Pro									1056
gtt aag gcg Val Lys Ala 355		Arg Glu							1104
gac agg caa Asp Arg Gln 370									1152
tga									1155
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			or Val						
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<213> Brass <220> <223> Xaa = <400> 2 Met Gly Ala 1 Glu Thr Asp Val Gly Glu	Phe, Leu Gly Gly 5 Thr Ile 20	ı, Ile, c Arg Met Lys Arg	Gln Val Val Pro 25	10 Cys Glu	Thr Pro	Pro 30	15 Phe	Thr	
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His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
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Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
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                                    170
Gly Arq Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                                185
                                                     190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Arg
                            200
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
                        215
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
                    230
                                        235
Phe Arg Tyr Ala Ala Gly Gln Gly Val Ala Ser Met Val Cys Phe Tyr
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                                265
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
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                            280
Asp Trp Phe Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
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                                             300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
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                                        315
Pro Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325
                                    330
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
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Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
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Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
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<221> misc feature
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gaa acc gac acc atc aag cgc gta ccc tgc gag aca ccg ccc ttc act
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
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25

20

_		_		_	aaa Lys	-			_		-			_	_	144
		_			tcc Ser					_				_		192
_					gcc Ala 70											240
				_	tgg Trp					_	_			_	_	288
			_		gtc Val		_		_	_				_		336
_	_		_		ctt Leu	_	_		_							384
			_		tac Tyr				_		_		_	_		432
					tcc Ser 150			_	_	_			_		_	480
_	_		_		aag Lys				_						_	528
	_				tta Leu											576
					gtc Val											624
_					aac Asn	_					-	_	-			672
					gac Asp 230											720

ttc cgt tac gcc of Phe Arg Tyr Ala				
gga gtc ccg ctt (Gly Val Pro Leu : 260				
ttg cag cac acg of Leu Gln His Thr 1 275	His Pro Ser	-		
gat tgg ttc agg (Asp Trp Phe Arg (290				
ttg aac aag gtc Leu Asn Lys Val 305				
ccg ttc tcc acg				• •
ata aag ccg ata Ile Lys Pro Ile: 340		-		
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gac agg caa ggt Asp Arg Gln Gly 370			_	
tga				1155
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Val Gly Glu Leu 35	Lys Lys Ala	Ile Pro Pro His	Cys Phe Lys Arg 45	Ser

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Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
Cys Phe Tyr Tyr Xaa Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
                     70
                                         75
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
Leu Thr Gly Val Trp Val Ile Ala His Lys Cys Gly His His Ala Phe
                                105
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
                            120
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Ser His
                        135
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
                    150
                                        155
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
               165
                                   170
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                               185
            180
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Arg
                            200
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
                        215
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
                    230
                                        235
Phe Arg Tyr Ala Ala Gly Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245
                                    250
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                                265
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
                            280
Asp Trp Phe Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
                        295
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
                    310
Pro Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325
                                    330
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
                                345
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
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Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
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<212> DNA

<213> Brassica napus

<220>

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<222> (1)...(1152)

<223> Wild type Fad2

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_		_			_	cgc Arg	_		_			_			96
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		_				tac Tyr 55				_			_		192
_				_	_	acc Thr									240
				_		cct Pro				_	_	_	 _	_	288
			_		_	ata Ile	_			_					336
						gac Asp									384
			_			ttc Phe 135			_						432
						ctc Leu									480
						tgg Trp									528
	_			_		acg Thr	_	_							576
						tcg Ser									624

tgc cat Cys His 210	Phe				_					_	_		-		672
cag ata Gln Ile 225				_	_				_	_	_				720
tac cgc Tyr Arg		_	_	_			_	_	_	_	_	_			768
gga gtt Gly Val															816
ttg cag Leu Gln		_				_				_	_				864
gat tgg Asp Trp 290	Leu														912
ttg aac Leu Asn 305	_	_					_	_	_						960
ctg ttc Leu Phe	_		_	_					_	_	_	-			1008
ata aag Ile Lys	_		_												1056
gtt aag Val Lys		_					_		_				_	_	1104
gac agg Asp Arg 370	Gln														1152
tga															1155
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<213> B	rass	ıca :	napu	5											

Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser

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Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
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Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
                         55
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
                    70
                                        75
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
                            120
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
                       135
                                           140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
                    150
                                        155
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165
                                    170
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                               185
                                                    190
            180
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
                            200
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
                        215
                                            220
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
                    230
Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                                   250
               245
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                             265
            260
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
                            280
        275
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
                        295
                                            300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
                    310
                                        315
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325
                                    330
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Leu His Gly Thr Pro Val
                                345
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
                           360
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
    370
                        375
                                            380
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<210> 7

<211> 1155

<212> DNA

<213> Brassica napus

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											gac Asp					624
_						-					gac Asp 220	_		-		672
_					_	-				_	gtc Val	_				720
	_		_	_	_			-	-	_	atg Met	_	_			768
	_	_		_		-					gtt Val	_				816
Leu	Gln	His 275	Thr	His	Pro	Ser	Leu 280	Pro	His	Tyr	gac Asp	Ser 285	Ser	Glu	Trp	864
Asp	Trp 290	Leu	Arg	Gly	Ala	Leu 295	Ala	Thr	Val	Asp	aga Arg 300	Asp	Tyr	Gly	Ile	912
											cac His					960
Leu	Phe	Ser	Thr	Met 325	Pro	His	Tyr	His	Ala 330	Met	gaa Glu	Ala	Thr	Lys 335	Ala	1008
Ile	Lys	Pro	Ile 340	Leu	Gly	Glu	Tyr	Tyr 345	Gln	Leu	cat His	Gly	Thr 350	Pro	Val	1056
											atc Ile					1104
											tac Tyr 380					1152
tga																1155

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<212> PRT

<213> Brassica napus

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<211> 1155 <212> DNA <213> Brassica napus <220> <221> CDS <222> (1) . . . (1152) <400> 9 atg ggt gca ggt gga aga atg caa gtg tct cct ccc tcc aaa aag tct 48 Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser 10 gaa acc gac aac atc aag cgc gta ccc tgc gag aca ccg ccc ttc act 96 Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg 144 Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser ate cet ege tet the tee tae etc ate tgg gae ate ate ata gee tee 192 Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser 55 50 tgc ttc tac tac gtc gcc acc act tac ttc cct ctc cct cac cct 240 Cys Phe Tyr Tyr Val Ala Thr Tyr Phe Pro Leu Leu Pro His Pro 65 75 288 ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc cag ggc tgc gtc Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val cta acc ggc gtc tgg gtc ata gcc cac gag tgc ggc cac cac gcc ttc 336 Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe 100 105 age gae tac cag tgg ctg gae gae ace gte gge ete ate tte cae tee 384 Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser 115 120 ttc ctc ctc gtc cct tac ttc tcc tgg aag tac agt cat cga cgc cac 432 Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His 130 135 480 cat tcc aac act ggc tcc ctc gag aga gac gaa gtg ttt gtc ccc aag His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys 150 155 aag aag tca gac atc aag tgg tac ggc aag tac ctc aac aac cct ttg 528 Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu 165 170 175

	_			_	tta Leu	_	_	_							_	576	
		_			gtc Val	_		_							_	624	
-					aac Asn	_					_	_		_		672	
_					gac Asp 230											720	
	_		_	_	gtc Val			-	-	_	_	_	_			768	
	_			_	att Ile	_					-	_				816	
_	_		_		cct Pro											864	
_		_			gct Ala											912	
					cac His 310											960	
					ccg Pro											1008	
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tga																1155	

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Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
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Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
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Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
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Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
               85
                                    90
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
                                105
            100
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
                            120
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
                        135
                                            140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
                    150
                                        155
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165
                                    170
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                               185
                                                    190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
                            200
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
                        215
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
                    230
                                        235
Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                                    250
                245
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                                265
            260
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
                            280
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
                        295
                                            300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
                                        315
                    310
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325
                                    330
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
                                345
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
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	_		gtg Val 180	_		_	_	_							_	576
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1152

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Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala

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atc cct cgc tct Ile Pro Arg Ser 50			_	
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_	_		_		_				-				aac Asn		_	528
_													tgg Trp 190			576
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_						_					_	_	gag Glu	_		672
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_		_	_										gcg Ala			960
_			_	_	_					_	_	_	acc Thr	_		1008
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tga																1155
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Ile	Pro 50	Arg	Ser	Phe	Ser	Tyr 55	Leu	Ile	Trp	Asp	Ile 60	Ile	Ile	Ala	Ser	
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65 Leu	Ser	Tyr	Phe	Ala	70 Trp	Pro	Leu	Tyr	Trp	75 Ala	Cys	Gln	Gly	Cys		
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ьeu	Tnr	GIY	va1 100	Trp	Val	iie	Ala	105	GIU	Сув	GIY	птэ	110	Ald	PHE	
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225	3		*1-	77-	230		a 1	17-1	71.	235	Mo+	17-1	C+	Dho	240	
rne	Arg	ıyr	нта	A1a 245	Ala	GIII	στλ	۷dT	250	ser	HEC	val	сув	255	тут	
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Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His 305 310 310 315 320 Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala 325 335 Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val 340 340 345 350 Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro 355 360 365 Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu 370 375 380 <pre> </pre> <pre> </pre> <pre> </pre> <pre> <pre> </pre> <pre> </pre> <pre> </pre> <pre> </pre> <pre> <pre> <pre> </pre> <pre> <pre> </pre> <pre> <pre> </pre> <pre> <pre> <pre> <pre> </pre> <pre> <pre> <pre> <pre> </pre> <pre> <pr< th=""><th>290</th><th></th><th>295</th><th>300</th><th>0</th><th></th></pr<></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre>	290		295	300	0	
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125 330 335 336 335 340 345 340 345 350 350 350 340 345 350 350 350 350 360 365					a Ala Thr Lve	
The Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val 340	neu File Ser		mis lyl mis		_	AIG
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Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr 20 25 30 30 30 30 30 30 30 30 30 30 30 30 30	gaa acc gac	acc atc aag	cac ata ccc	tac gag aca	a ccq ccc ttc	act 96
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Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser 40 45 atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser 50 55 60 tgc ttc tac tac gtc gcc acc act tac ttc cct ctc ctc cct cac cct Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro 65 70 75 80 ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc caa ggg tgc gtc Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val 85 90 95 cta acc ggc gtc tgg gtc ata gcc cac gag tgc ggc cac cac gcc ttc Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe			~~~	aaa aaa tat	t tta 222 aaa	t.ca 144
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Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro 80 ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc caa ggg tgc gtc Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val 85 cta acc ggc gtc tgg gtc ata gcc cac gag tgc ggc cac cac gcc ttc Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe	30		33	•		
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Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe		85		90	95	
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe	ata aca cac	ata taa ata	, ata doc cac	gag too oo	ר כפר כפר מכר	ttc 336
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age gae tae cag tgg ett gae gae ace gte ggt ete ate tte cae tee 384						
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_	_		-								cac His					528
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65	C IYI	-7-	Val	70			-1-	1110	75	200	Dou	110	1110	80	
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Leu Th	r Gly	Val 100		Val	Ile	Ala	His 105		Cys	Gly	His	His 110	Ala	Phe	
Ser As	_	Gln	Trp	Leu	Asp			Val	Gly	Leu			His	Ser	
Phe Le	115 u Leu		Pro	Tyr	Phe	120 Ser	Trp	Lys	Tyr	Ser	125 His	Arg	Arg	His	
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His Se	r Asn	Thr	Gly		Leu	Glu	Arg	Asp	Glu 155	Val	Phe	Val	Pro	Lys 160	
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Phe Ar	g Tyr	Ala		Ala	Gln	Gly	Val		Ser	Met	Val	Cys		Tyr	
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GIY VA	1 510	neu	пеи	116	val	UDII	GTÅ	FIIG	שכu	vaı	ыeu	116	****	* A T	

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Asp Trp Leu 290	Arg Gly Ala	Leu Ala 295	Thr Val	Asp Arg Asp 300	Tyr Gly	Ile
Leu Asn Lys	Val Phe His	Asn Ile	-		Ala His	His
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Leu Phe Ser	Thr Met Pro	His Tyr	His Ala I	Met Glu Ala	Thr Lys	Ala
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•	J		10		15	
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Glu Thr Asp	Thr lie Ly	s Arg vai	25	Glu Thr Pro	30	Thr
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var Gry Gru		40	PIO PIO	His Cys Phe 45	TAR MIG	ser
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	-		Tyr Phe	Pro Leu Leu	Pro His	
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ctc tcc tac	ttc gcc tg	g cct ctc	tac tgg	gcc tgc caa	ggg tgc	gtc 288
Leu Ser Tyr		Pro Leu		Ala Cys Gln		Val
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Leu Thr Gly	-	l Ile Ala		Cys Gly His		Phe
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			_						_			cat His	_	_		432
												ttt Phe				480
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_												gtg Val				960

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Cys		Tyr	Tyr	Val	Ala		Thr	Tyr	Phe	Pro		Leu	Pro	His		
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